



DEFENSE INFORMATION SYSTEMS AGENCY

JOINT INTEROPERABILITY TEST COMMAND

P.O. BOX 12798

FORT HUACHUCA, ARIZONA 85670-2798

IN REPLY
REFER TO:

Battlespace Communications Portfolio (JTE)

25 April 2008

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of the Alcatel-Lucent Assured Services Voice Application Local Area Network (ASVALAN) and Voice Application Local Area Network (VALAN) with Specified Software Releases

References: (a) DoD Directive 4630.5, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b) CJCSI 6212.01D, "Interoperability and Supportability of Information Technology and National Security Systems," 8 March 2006
(c) through (e)

1. References (a) and (b) establish the Defense Information Systems Agency (DISA), Joint Interoperability Test Command (JITC), as the responsible organization for interoperability test certification.

2. The Alcatel-Lucent ASVALAN and VALAN with Specified Software Releases is hereinafter referred to as the system under test (SUT). The SUT meets all of its critical interoperability requirements and is certified as interoperable for joint use within the Defense Switched Network (DSN). The SUT is certified for joint use within the DSN with the Digital Switching Systems on the DSN Approved Products List (APL) which are certified for use with an ASVALAN or VALAN. The SUT components which are bolded and underlined in the tables throughout this certification letter are components that were tested in the JITC laboratory for this certification. The SUT components which are not bolded and not underlined, but also listed throughout the tables in this letter, are certified for joint use in the DSN as well. The JITC analysis determined these components contain the same hardware and software and are functionally identical to the tested components for interoperability certification purposes. The SUT is certified to support DSN Assured Services over Internet Protocol as an ASVALAN. If a system meets the minimum requirements for an ASVALAN, it also meets the lesser requirements for a VALAN. However, since VALANs do not support the Assured Services Requirements detailed in reference (c), Command and Control (C2) users and Special C2 users are not authorized to be served by a VALAN. Since VALANs do not support Assured Services, they can only serve Department of Defense (DoD), non-DoD, non-governmental, and foreign government users having no missions or communications requirement to ever originate or receive C2 communications. VALAN connectivity to the DSN is not authorized until a waiver is granted by the Joint Staff for each site. The SUT is certified for joint use as a VALAN for non-C2 traffic. The VALAN requirements differing from those of an ASVALAN include:

- C2 traffic shall not traverse a VALAN.

JITC Memo, JTE, Special Interoperability Test Certification of the Alcatel-Lucent Assured Services Voice Application Local Area Network (ASVALAN) and Voice Application Local Area Network (VALAN) with Specified Software Releases

- Reliability is a conditional requirement for a VALAN.
- Network Management features are conditional requirements for a VALAN.

Testing did not include video services or data applications; however, simulated data traffic was generated during testing to determine its effect on voice traffic. This certification expires upon changes that could affect interoperability, but no later than three years from the date of this memorandum.

3. This finding is based on interoperability testing conducted by JITC and a review of the vendor's Letters of Compliance (LoC). Testing was conducted at JITC's Global Information Grid Network Test Facility at Fort Huachuca, Arizona, from 19 November 2007 through 18 January 2008. Review of the vendor's LoC was completed on 3 April 2008. Enclosure 2 documents the test results and describes the tested network.

4. The overall interoperability status of the SUT is indicated in table 1. The ASVALAN and VALAN system requirements are listed in table 2. In addition to system level requirements, components that comprise the SUT must meet specific criteria to be certified for use as core, distribution, or access components. The interoperability status of the SUT components is listed in table 3. The ASVALAN and VALAN requirements used to certify the components are listed in table 4. This interoperability test status is based on the SUT's ability to meet:

- a. Assured Services as defined in reference (c).
- b. Local Area Network system requirements specified in reference (d) verified through JITC testing and/or vendor submission of LoC.
- c. Internet Protocol version 6 requirements specified in reference (d), paragraph 1.7, table 1-4, verified through vendor submission of LoC signed by the Vice President of the company.
- d. The overall system interoperability performance derived from test procedures listed in reference (e).

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Table 1. SUT Interoperability Status

System Interoperability Status			
Components (See note.)	Release	Status	Remarks
<u>OS9700-RCB-A</u>	6.1.5.506.R01	Certified	All ASVALAN and VALAN system requirements were met when the SUT was configured in accordance with architecture provided in enclosure 2. Additional details about component level certification are provided in table 3. Security testing is accomplished through DISA-led Information Assurance Test teams and published in a separate report.
<u>OS6850-P48</u> , OS6850-P48H, OS6850-P48L, OS6850-P48LH, OS6850-48D, OS6850-48L, OS6850-48LD	6.1.5.506.R01		
<u>OS6850-P24</u> , OS6850-P24H, OS6850-24, OS6850-24D, <u>OS6850-P24L</u> , OS6850-24LD, OS6850-24L, OS6850-24LH	6.1.5.506.R01		
LEGEND: <div>ASVALAN A - Alternating current power supply D - Assured Services Voice Application Local Area Network DISA - Direct current power supply H - Defense Information Systems Agency JITC - High-PoE power supply (510 watts) L - Joint Interoperability Test Command - License (software license upgrade) OS - OmniSwitch P, PoE - Power over Ethernet RCB - Redundant Chassis Bundle SUT - System Under Test T - Telco VALAN - Voice Application Local Area Network</div>			
NOTE: Components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same software and hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use.			

Table 2. ASVALAN and VALAN System Requirements

System Requirements				
Requirement	Criteria		Reference	Required
Delay	One-way packet delay for voice packets of an established call (signaling and media) shall be 5 ms or less averaged over any 5-minute period.		GSCR, Appendix 3, Section A.3.3.1.1	Yes
Jitter	For voice media packets, jitter shall be 5 ms or less averaged over any 5-minute period.		GSCR, Appendix 3, Section A.3.3.1.2	Yes
Packet Loss	Voice packet loss within the LAN shall not exceed 0.05% averaged over any 5-minute period.		GSCR, Appendix 3, Section A.3.3.1.3	Yes
Reliability	ASVALAN	- ASVALANs shall have a reliability of .99999 - No single point of failure for outage of more than 64 telephony subscribers - Network Path restores within 2 seconds	GSCR, Appendix 3, Section A.3.3.4.1	Yes
	VALAN	- This requirement is conditional for a VALAN.	GSCR, Appendix 3, Section A.3.3.4.1	No
IPv6 ¹	All IP devices shall be IPv6 capable.		GSCR, Paragraph 1.7, and GSCR Appendix 3, Section A3.2.8	Yes
Security ²	DIACAP (replacement for DITSCAP)/IA		GSCR, Appendix 3, Section A.3.3.4.3	Yes
LEGEND: ASVALAN - Assured Services Voice Application LAN DIACAP - DoD IA Certification and Accreditation Process DISA - Defense Information Systems Agency DITSCAP - DoD IT Security Certification and Accreditation Process DoD - Department of Defense GSCR - Generic Switching Center Requirements IA - Information Assurance IP - Internet Protocol IPv4 - Internet Protocol version 4 IPv6 - Internet Protocol version 6 IT - Information Technology LAN - Local Area Network ms - milliseconds VALAN - Voice Application LAN				
NOTES: 1 An IPv6 capable system or product, as defined in the GSCR, paragraph 1.7, shall be capable of receiving, processing, and forwarding IPv6 packets and/or interfacing with other systems and protocols in a manner similar to that of IPv4. IPv6 capability is currently satisfied by a vendor Letter of Compliance signed by the Vice President of the company. The vendor must state, in writing, compliance to the following criteria: a. Conformance with IPv6 standards profile contained in the DoD IT Standards Registry (DISR). b. Maintaining interoperability in heterogeneous environments and with IPv4. c. Commitment to upgrade as the IPv6 standard evolves. d. Availability of contractor/vendor IPv6 technical support. 2 Security testing is accomplished via DISA-led Information Assurance test teams and published in a separate report.				

JITC Memo, JTE, Special Interoperability Test Certification of the Alcatel-Lucent Assured Services Voice Application Local Area Network (ASVALAN) and Voice Application Local Area Network (VALAN) with Specified Software Releases

Table 3. SUT Component Interoperability Status

Component Interoperability Status					
Component (See note.)	Release	Sub-component (See note.)	Status	Layer (s)	Remarks
<u>OS9700-RCB-A</u>	6.1.5.506.R01	<u>OS9600/OS9700-CMM</u>	Certified	Core, Distribution, Access	All CRs and FRs were met.
		<u>OS9-XNI-U2</u>	Certified		
		<u>OS9-GNI-U24</u>	Certified		
		<u>OS9-GNI-P24</u>	Certified		
		OS9-GNI-C24	Certified		
		OS9-GNI-C48T	Certified		
<u>OS6850-P48</u> , OS6850-P48H, OS6850-P48L, OS6850-P48LH, OS6850-48D, OS6850-48L, OS6850-48LD	6.1.5.506.R01	Not Applicable	Certified	Access	All CRs and FRs were met.
<u>OS6850-P24</u> , OS6850-P24H, OS6850-24, OS6850-24D, <u>OS6850-P24L</u> , OS6850-24LD, OS6850-24L, OS6850-24LH	6.1.5.506.R01	Not Applicable	Certified	Access	All CRs and FRs were met.
LEGEND: A - Alternating current power supply CMM - Chassis Management Module CRs - Capability Requirements D - Direct current power supply FRs - Feature Requirements G - Gigabit H - High-PoE power supply (510 watts) JITC - Joint Interoperability Test Command L - License (software license upgrade) NI - Network Interface OS - OmniSwitch P, PoE - Power over Ethernet RCB - Redundant Chassis Bundle SUT - System Under Test U - Unshielded Twisted Pair T - Telco X - 10 Gigabit Small Form Factor Pluggable					
NOTE: Components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same software and hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use.					

Table 4. ASVALAN and VALAN Component Requirements

Core/Distribution/Access Component Requirements			
Requirement	Criteria	Reference	Required
CoS Models	LAN components shall support IEEE 802.1p to DSCP mapping and at least one of the following: - IEEE 802.1p/Q priority tagging/VLAN tagging - DSCP - ToS	GSCR, Appendix 3, Section A.3.3.2.1	Yes
Traffic Prioritization	Traffic within LAN components shall be prioritized so that voice signaling receives highest priority, voice media second highest priority, and data lowest priority.	GSCR, Appendix 3, Section A.3.3.2.2	Yes
QoS	LAN components shall support one of the following: - Priority Queuing - Custom Queuing - Weighted Fair Queuing - Class Based Weighted Fair Queuing	GSCR, Appendix 3, Section A.3.3.3.1	Yes
Policing	LAN components shall support one of the following: - DSCP PHB - Generic Traffic Shaping - Class-Based Shaping	GSCR, Appendix 3, Section A.3.3.3.2	Yes
VLANs	LAN components shall support: - Port based VLANs - MAC address based VLANs - Protocol based VLANs	GSCR, Appendix 3, Section A.3.3.3.3	Yes

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Table 4. ASVALAN and VALAN Component Requirements (continued)

Core/Distribution/Access Component Requirements				
Requirement	Criteria		Reference	Required
IEEE Conformance	LAN components shall support: - IEEE 802.1d – Bridging - IEEE 802.1p/Q – Priority tagging/VLAN tagging - IEEE 802.1s – Per-VLAN Group Spanning Tree - IEEE 802.1v – VLAN Classification by port and protocol - IEEE 802.1w – Rapid Reconfiguration of Spanning Tree - IEEE 802.1x – Port Based Network Access Control - IEEE 802.3ad – Link Aggregation Protocol		GSCR, Appendix 3, paragraph A.3.3.4	Yes
Reliability	ASVALAN	LAN components shall support: - ASVALAN components shall have a reliability of .99999 or better - Dual power supplies and dual processors (more than 64 users) - N+1 sparing for access (more than 64 users) - Redundancy protocol ¹ - 2 second path restoral	GSCR, Appendix 3, Section A.3.3.4.1	Yes
	VALAN	This requirement is conditional for a VALAN.	GSCR, Appendix 3, Section A.3.3.4.1	No
Network Management	ASVALAN	LAN components shall support: - In-band or out-of-band management - SNMP - Measurements	GSCR, Appendix 3, Section A.3.3.4.2	Yes
	VALAN	This requirement is conditional for a VALAN.	GSCR, Appendix 3, Section A.3.3.4.2	No
Security	LAN components shall employ the Network Infrastructure and VoIP STIGs. ²		GSCR, Appendix 3, Section A.3.3.4.3	Yes
IPv6	All IP devices shall be IPv6 capable. ³		GSCR, Paragraph 1.7, and GSCR Appendix 3, Section A3.2.8	Yes
TE	ASVALAN	- ASVALAN components shall be engineered for a maximum of 25% voice traffic per link. ⁴ - For more than 64 users, link pairs (redundant links) must be used.	GSCR, Appendix 3, Section A.3.3.4.4	Yes
	VALAN	VALAN components shall be engineered for a maximum of 25% voice traffic per link. ⁴	GSCR, Appendix 3, Section A.3.3.4.4	Yes
LEGEND: 802.1d - Standard for Local and Metropolitan Area Networks: MAC Bridges 802.1p - LAN Layer 2 QoS/CoS Protocol for Traffic Prioritization 802.1Q - Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks 802.1s - Standard for Local and Metropolitan Area Networks - Amendment 3 to 802.1Q Virtual Bridged Local Area Networks: Multiple Spanning Trees 802.1v - Standard for Local and Metropolitan Area Networks - Virtual Bridge Local Area Networks - Amendment 2: VLAN Classification by Protocol and Port (Amendment to IEEE 802.1Q, 1998 Edition) 802.1w - Standard for Local and metropolitan area networks - Common Specifications - Part 3: Media Access Control (MAC) Bridges: Rapid Configuration 802.1x - Standard for Local and Metropolitan Area Networks Port-Based Network Access Control 802.3ad - Standard for Information Technology – Local and Metropolitan Area Networks – Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications–Aggregation of Multiple Link Segments ASVALAN - Assured Services Voice Application LAN CoS - Class of Service DISA - Defense Information Systems Agency DSCP - Differentiated Services Code Point GSCR - Generic Switching Center Requirements IEEE - Institute of Electrical and Electronics Engineers IP - Internet Protocol IPv4 - Internet Protocol version 4 IPv6 - Internet Protocol version 6 LAN - Local Area Network MAC - Media Access Control Mbps - Megabits per second N - total VoIP users / 64 OSPF V.3 - Open Shortest-Path First Version 3 PHB - Per Hop Behaviors QoS - Quality of Service SNMP - Simple Network Management Protocol STIGs - Security Technical Implementation Guides TE - Traffic Engineering ToS - Type of Service VALAN - Voice Application LAN VLANs - Virtual LANs VoIP - Voice over Internet Protocol VRRP - Virtual Router Redundancy Protocol				
NOTES: 1 For core and distribution components, OSPF V.3 redundancy protocol shall be the routing protocol supported. For access components, redundancy protocol shall be VRRP or equivalent protocol. 2 Verified using the Information Assurance Test Plan. Results of the security testing are published in a separate test report generated by the DISA Information Assurance test personnel. 3 An IPv6 capable system or product, as defined in the GSCR, paragraph 1.7, shall be capable of receiving, processing, and forwarding IPv6 packets and/or interfacing with other systems and protocols in a manner similar to that of IPv4. IPv6 capability is currently satisfied by a vendor Letter of Compliance signed by the Vice President of the company. The vendor must state, in writing, compliance to the following criteria: a. Conformance with IPv6 standards profile contained in the Department of Defense Information Technology Standards Registry (DISR). b. Maintaining interoperability in heterogeneous environments and with IPv4. c. Commitment to upgrade as the IPv6 standard evolves. d. Availability of contractor/vendor IPv6 technical support. 4 Instruments connected to an access device must provide a minimum of a 10 Mbps full duplex link. For core and distribution connections, the minimum link capacity is 100 Mbps full duplex.				

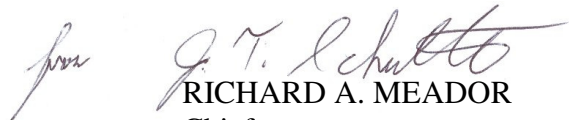
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5. No detailed test report was developed in accordance with the Program Manager's request. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNet at <https://stp.fhu.disa.mil>. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at <https://jit.fhu.disa.mil> (NIPRNet), or <http://199.208.204.125> (SIPRNet). Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at <http://jitc.fhu.disa.mil/tssi>.

6. The JITC point of contact is Mr. Joseph Roby, DSN 879-0507, commercial (520) 538-0507, FAX DSN 879-4347, or e-mail to joseph.robby@disa.mil. The tracking number for the SUT is 0709501.

FOR THE COMMANDER:

2 Enclosures a/s


RICHARD A. MEADOR
Chief
Battlespace Communications Portfolio

Distribution:

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Defense Information Systems Agency, Net-Centricity Requirements and Assessment Branch, ATTN: GE333, Room 244, P.O. Box 4502, Falls Church, VA 22204-4502

Office of Chief of Naval Operations (N71CC2), CNO N6/N7, 2000 Navy Pentagon, Washington, DC 20350

Headquarters U.S. Air Force, AF/XICF, 1800 Pentagon, Washington, DC 20330-1800

Department of the Army, Office of the Secretary of the Army, CIO/G6, ATTN: SAIS-IOQ, 107 Army Pentagon, Washington, DC 20310-0107

U.S. Marine Corps (C4ISR), MARCORSYSCOM, 2200 Lester St., Quantico, VA 22134-5010
DOT&E, Net-Centric Systems and Naval Warfare, 1700 Defense Pentagon, Washington, DC 20301-1700

U.S. Coast Guard, CG-64, 2100 2nd St. SW, Washington, DC 20593

Defense Intelligence Agency, 2000 MacDill Blvd., Bldg 6000, Bolling AFB, Washington, DC 20340-3342

National Security Agency, ATTN: DT, Suite 6496, 9800 Savage Road, Fort Meade, MD 20755-6496

Director, Defense Information Systems Agency, ATTN: GS235, Room 5W24-8A, P.O. Box 4502, Falls Church, VA 22204-4502

Office of Assistant Secretary of Defense (NII)/DoD CIO, Crystal Mall 3, 7th Floor, Suite 7000, 1851 S. Bell St., Arlington, VA 22202

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Office of Under Secretary of Defense, AT&L, Room 3E144, 3070 Defense Pentagon,
Washington, DC 20301

U.S. Joint Forces Command, J68, Net-Centric Integration, Communications, and Capabilities
Division, 1562 Mitscher Ave., Norfolk, VA 23551-2488

Defense Information Systems Agency (DISA), ATTN: GS23 (Mr. McLaughlin), Room 5W23,
5275 Leesburg Pike (RTE 7), Falls Church, VA 22041

ADDITIONAL REFERENCES

- (c) Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6215.01C, "Policy for Department of Defense Voice Services with Real Time Services (RTS)," 9 November 2007
- (d) Defense Information Systems Agency (DISA), "Defense Switched Network (DSN) Generic Switching Center Requirements (GSCR), Appendix 3, Errata Change 2," 14 December 2006, Revised 27 March 2007
- (e) Joint Interoperability Test Command, "Defense Switched Network Generic Switch Test Plan (GSTP), Change 2," 2 October 2006

CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. Alcatel-Lucent Assured Services Voice Application Local Area Network (ASVALAN) and Voice Application Local Area Network (VALAN) with Specified Software Releases are hereinafter referred to as the system under test (SUT).

2. PROPONENT. Hawaii Information Transfer System (HITS) Joint Hawaii Information Transfer System (JHITS).

3. PROGRAM MANAGER. JoAnne Rhoden, HITS/JHITS Program Manager (PM), GS232, 477 Essex Street, Bldg 77, Pearl Harbor, Hawaii, 96860, e-mail: JoAnne.Rhoden@disa.mil.

4. TESTER. Joint Interoperability Test Command (JITC), Fort Huachuca, Arizona.

5. SYSTEM UNDER TEST DESCRIPTION. The SUT is used to transport voice signaling and media as part of an overall Voice over Internet Protocol (VoIP) system. All of the SUT switches provide availability, security, and Quality of Service (QoS) to meet the operational requirements of the network and Assured Services for the warfighter. The SUT components which are bolded and underlined in the tables throughout this certification letter, are components that were tested in the JITC laboratory for this certification. The SUT components which are not bolded and not underlined but also listed throughout the tables in this letter were determined by JITC analysis to contain the same hardware and software as, and to be functionally identical to, the tested components for interoperability certification purposes. The SUT is certified for joint use within the Defense Switched Network (DSN) with the Digital Switching Systems on the DSN Approved Products List (APL), which are certified for use with an ASVALAN or VALAN. The SUT is certified to support DSN Assured Services over Internet Protocol (IP) as an ASVALAN.

The SUT is composed of the following components:

The Alcatel-Lucent OS9700-RCB-A (OmniSwitch 9700) is a redundant chassis bundle (RCB) consisting of an OS9700 chassis with ten-slots. Two slots are for chassis management modules (CMM), eight slots are for OS9000 network interfaces (NIs). There are three power supply modules. The OmniSwitch 9700 series can provide Power over Ethernet (PoE) to any device, which is compliant with the Institute of Electrical and Electronics Engineers (IEEE) 802.3af standard. The switch features ten-gigabit fiber and one-gigabit fiber NIs for connections between the core, distribution and access layers. The DSN network and access layers connect to the SUT through the 10/100/1000BaseT Ethernet NIs. The OS9700-RCB-A supports Internet Protocol version 4 (IPv4)/Internet Protocol version 6 (IPv6) Layer 2 (L2) and Layer 3 (L3) switching.

The Alcatel-Lucent OS6850 (OmniSwitch 6850) series family delivers a variety of port capacities from 24 to 48 ports. The OS6850 series can provide PoE to any device,

which is compliant with the IEEE 802.3af standard. 10/100/1000BaseT access links, one-gigabit fiber, and ten-gigabit fiber uplinks are supported; however, ten-gigabit uplinks on the OS6850s were not available or evaluated during this test. Therefore, the ten-gigabit fiber uplinks are not certified by JITC or approved for use within the DSN by the Program Management Office (PMO). The OS6850 supports IPv4/IPv6 L2 and L3 switching.

6. OPERATIONAL ARCHITECTURE. The DSN architecture is a two-level network hierarchy consisting of DSN backbone switches and Service/Agency installation switches. Service/Agency installation switches have been authorized to extend voice services over IP infrastructures. The Generic Switching Center Requirements (GSCR) operational DSN Architecture is depicted in figure 2-1, which depicts the relationship of the ASVALAN and VALAN to the DSN switch types. The installation ASVALAN VoIP architecture is depicted in figure 2-2 and the VALAN VoIP architecture is depicted in figure 2-3. The ASVALAN and VALAN combined VoIP architecture is depicted in figure 2-4.

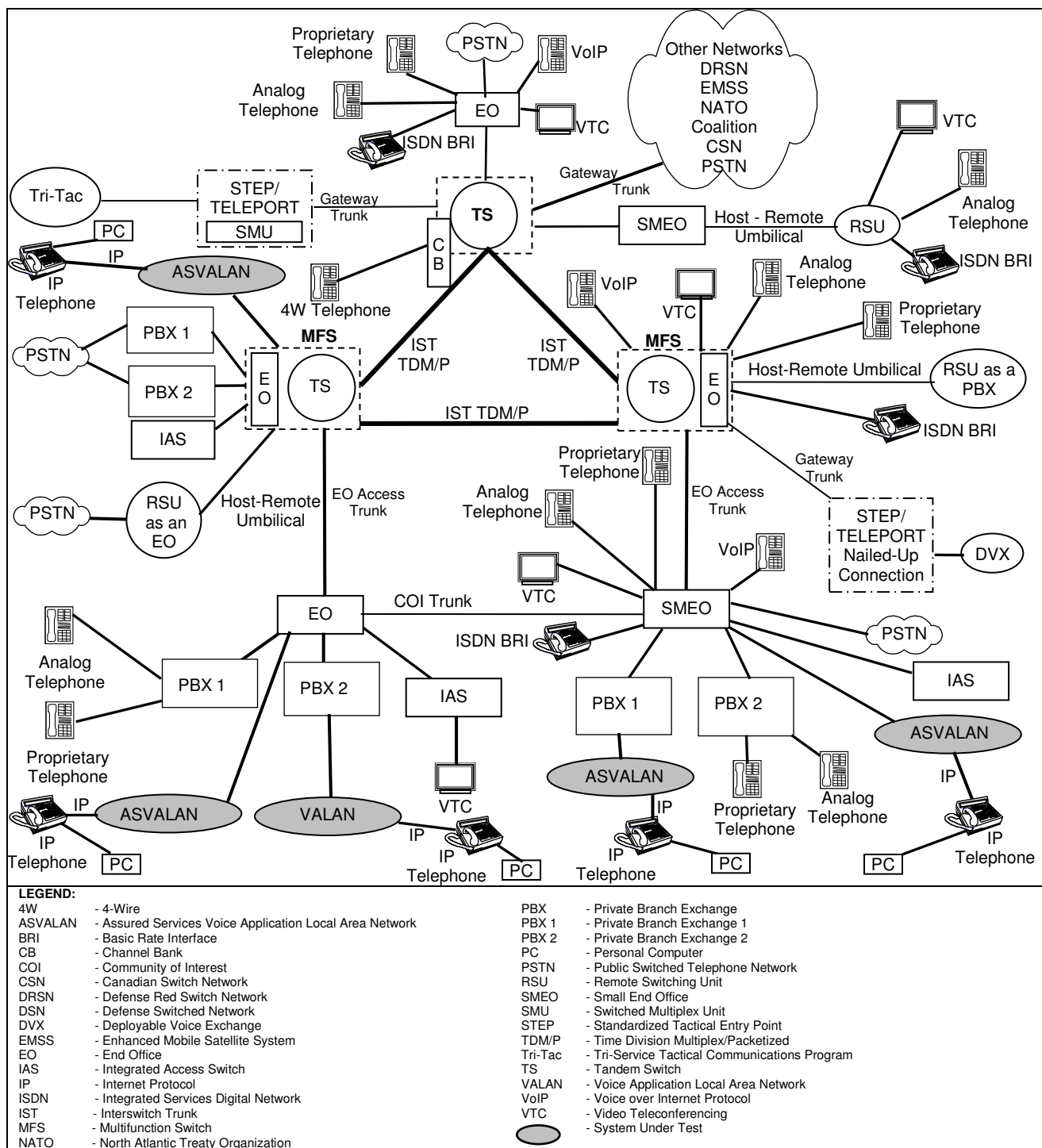


Figure 2-1. DSN Architecture

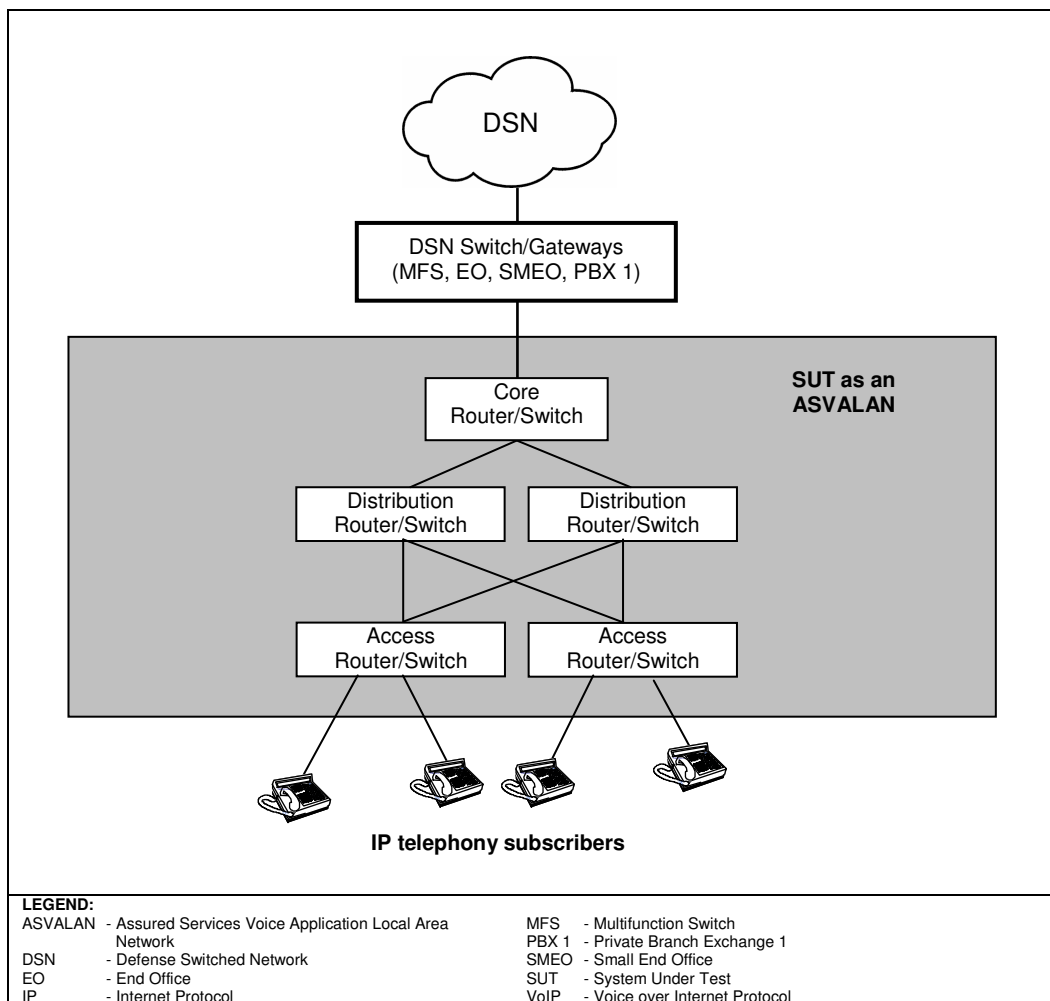


Figure 2-2. ASVALAN VoIP Architecture

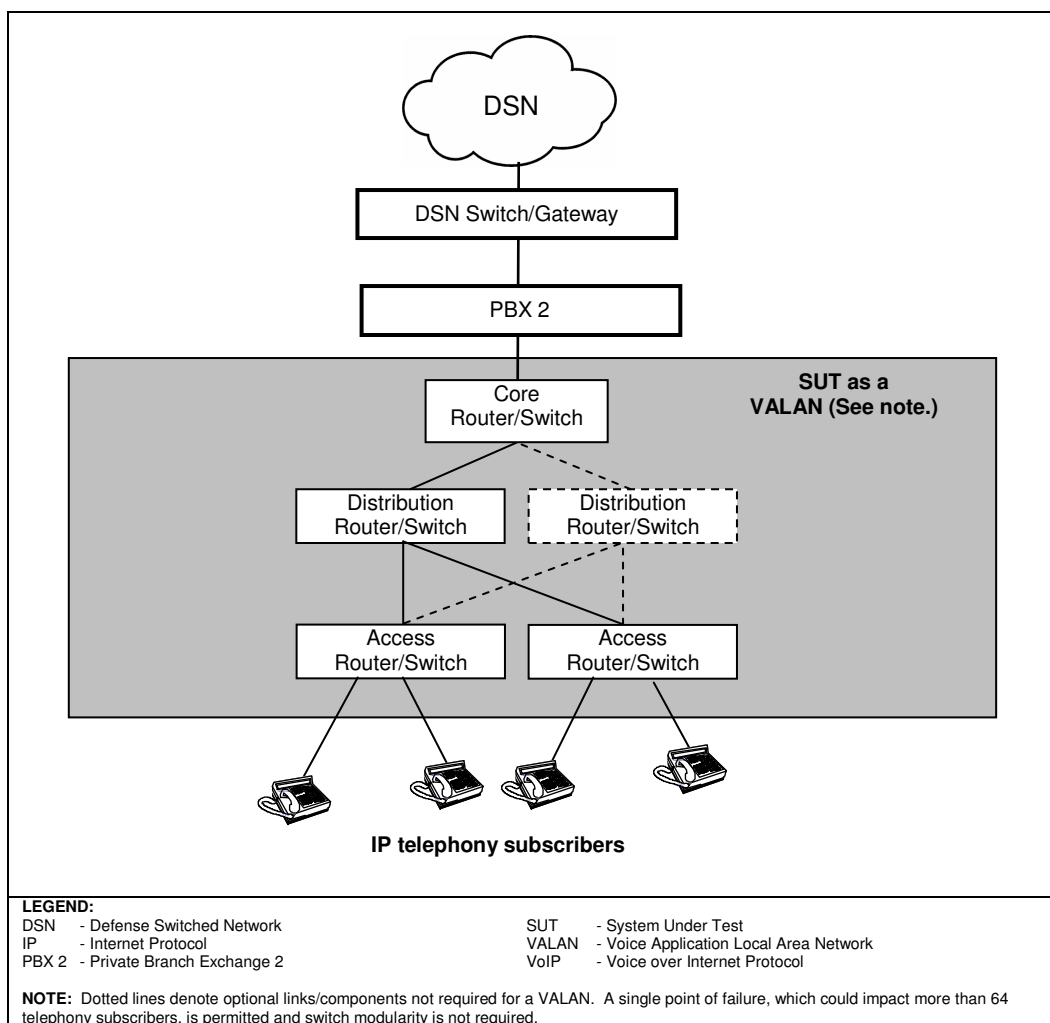


Figure 2-3. VALAN VoIP Architecture

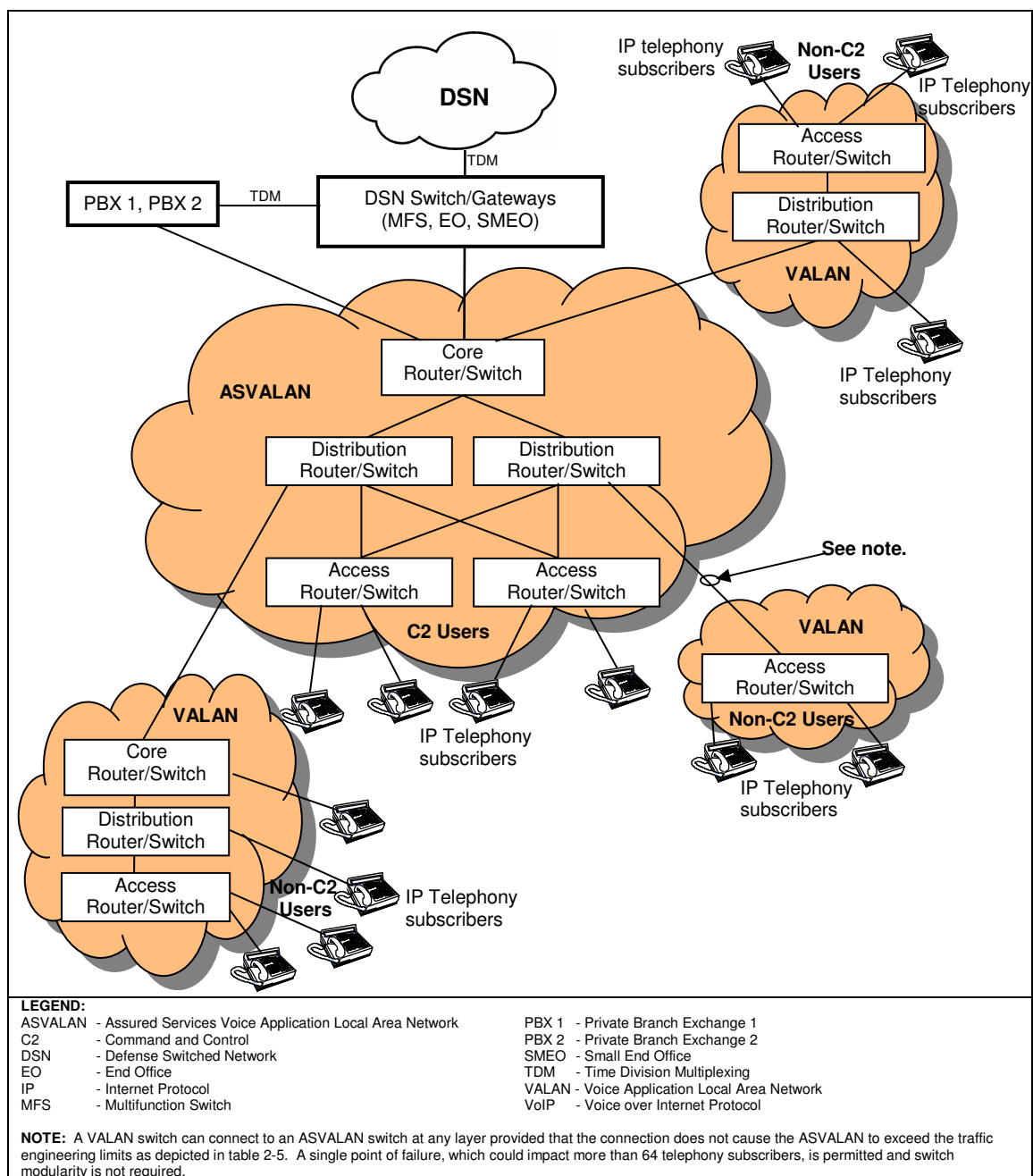


Figure 2-4. ASVALAN and VALAN Combined VoIP Architecture

7. REQUIRED SYSTEM INTERFACES. The SUT ASVALAN and VALAN system requirements are listed in table 2-1. The requirements specific to the SUT ASVALAN and VALAN components are shown in table 2-2. These requirements are derived from:

a. DSN services for Network and Applications specified in Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6215.01B, "Policy for Department of Defense Voice Services."

b. GSCR, appendix 3, Capability Requirements (CRs) and Feature Requirements (FRs) verified through JITC testing and/or vendor submission of Letters of Compliance (LoC).

Table 2-1. ASVALAN and VALAN System Requirements

System Requirements			
Requirement	Criteria	Reference	Required
Delay	One-way packet delay for voice packets of an established call (signaling and media) shall be 5 ms or less averaged over any 5-minute period.	GSCR, Appendix 3, paragraph A.3.3.1.1	Yes
Jitter	For voice media packets, jitter shall be 5 ms or less averaged over any 5-minute period.	GSCR, Appendix 3, paragraph A.3.3.1.2	Yes
Packet Loss	Voice packet loss within the LAN shall not exceed 0.05% averaged over any 5-minute period.	GSCR, Appendix 3, paragraph A.3.3.1.3	Yes
Reliability	ASVALAN <ul style="list-style-type: none"> - ASVALANs shall have a reliability of .99999 - No single point of failure for outage of more than 64 telephony subscribers - Network Path restores within 2 seconds 	GSCR, Appendix 3, paragraph A.3.3.4.1	Yes
	VALAN <ul style="list-style-type: none"> - This requirement is conditional for a VALAN. 	GSCR, Appendix 3, paragraph A.3.3.4.1	No
IPv6 ¹	All IP devices shall be IPv6 capable.	GSCR paragraph 1.7, and GSCR, Appendix 3, paragraph A3.2.8	Yes
Security ²	DIACAP (replacement for DITSCAP)/IA	GSCR, Appendix 3, paragraph A.3.3.4.3	Yes
LEGEND: ASVALAN - Assured Services Voice Application LAN DIACAP - DoD IA Certification and Accreditation Process DISA - Defense Information Systems Agency DITSCAP - DoD IT Security Certification and Accreditation Process DoD - Department of Defense GSCR - Generic Switching Center Requirements IA - Information Assurance IP - Internet Protocol IPv4 - Internet Protocol version 4 IPv6 - Internet Protocol version 6 IT - Information Technology LAN - Local Area Network ms - milliseconds VALAN - Voice Application LAN			
NOTES: 1 An IPv6 capable system or product, as defined in the GSCR, paragraph 1.7, shall be capable of receiving, processing, and forwarding IPv6 packets and/or interfacing with other systems and protocols in a manner similar to that of IPv4. IPv6 capability is currently satisfied by a vendor Letter of Compliance signed by the Vice President of the company. The vendor must state, in writing, compliance to the following criteria: a. Conformance with IPv6 standards profile contained in the DoD IT Standards Registry (DISR). b. Maintaining interoperability in heterogeneous environments and with IPv4. c. Commitment to upgrade as the IPv6 standard evolves. d. Availability of contractor/vendor IPv6 technical support. 2 Security testing is accomplished via DISA-led Information Assurance test teams and published in a separate report.			

Table 2-2. ASVALAN and VALAN Component Requirements

Core/Distribution/Access Component Requirements				
Requirement	Criteria		Reference	Required
CoS Models	LAN components shall support IEEE 802.1p to DSCP mapping and at least one of the following: - IEEE 802.1p/Q priority tagging/VLAN tagging - DSCP - ToS		GSCR, Appendix 3, paragraph A.3.3.2.1	Yes
Traffic Prioritization	Traffic within LAN components shall be prioritized so that voice signaling receives highest priority, voice media second highest priority, and data lowest priority.		GSCR, Appendix 3, paragraph A.3.3.2.2	Yes
QoS	LAN components shall support one of the following: - Priority Queuing - Custom Queuing - Weighted Fair Queuing - Class Based Weighted Fair Queuing		GSCR, Appendix 3, paragraph A.3.3.3.1	Yes
Policing	LAN components shall support one of the following: - DSCP PHB - Generic Traffic Shaping - Class-Based Shaping		GSCR, Appendix 3, paragraph A.3.3.3.2	Yes
VLANs	LAN components shall support: - Port based VLANs - MAC address based VLANs - Protocol based VLANs		GSCR, Appendix 3, paragraph A.3.3.3.3	Yes
IEEE Conformance	LAN components shall support: - IEEE 802.1d – Bridging - IEEE 802.1p/Q – Priority tagging/VLAN tagging - IEEE 802.1s – Per-VLAN Group Spanning Tree - IEEE 802.1v – VLAN Classification by port and protocol - IEEE 802.1w – Rapid Reconfiguration of Spanning Tree - IEEE 802.1x – Port Based Network Access Control - IEEE 802.3ad – Link Aggregation Protocol		GSCR, Appendix 3, paragraph A.3.3.4	Yes
Reliability	ASVALAN	LAN components shall support: - ASVALAN components shall have a reliability of .99999 or better - Dual power supplies and dual processors (more than 64 telephony subscribers) - N+1 sparing for access (more than 64 telephony subscribers) - Redundancy protocol ¹ - 2 second path restoral	GSCR, Appendix 3, paragraph A.3.3.4.1	Yes
	VALAN	This requirement is conditional for a VALAN.	GSCR, Appendix 3, paragraph A.3.3.4.1	No
Network Management	ASVALAN	LAN components shall support: - In-band or out-of-band management - SNMP - Measurements	GSCR, Appendix 3, paragraph A.3.3.4.2	Yes
	VALAN	This requirement is conditional for a VALAN.	GSCR, Appendix 3, paragraph A.3.3.4.2	No
Security	LAN components shall employ the Network Infrastructure and VoIP STIGs. ²		GSCR, Appendix 3, paragraph A.3.3.4.3	Yes
IPv6	All IP devices shall be IPv6 capable. ³		GSCR paragraph 1.7, and GSCR, Appendix 3, paragraph A3.2.8	Yes
TE	ASVALAN	- ASVALAN components shall be engineered for a maximum of 25% voice traffic per link. ⁴ - For more than 64 telephony subscribers, link pairs (redundant links) must be used.	GSCR, Appendix 3, paragraph A.3.3.4.4	Yes
	VALAN	VALAN components shall be engineered for a maximum of 25% voice traffic per link. ⁴	GSCR, Appendix 3, paragraph A.3.3.4.4	Yes

Table 2-2. ASVALAN and VALAN Component Requirements (continued)

LEGEND:	
802.1d	- Standard for Local and Metropolitan Area Networks: MAC Bridges
802.1p	- LAN Layer 2 QoS/CoS Protocol for Traffic Prioritization
802.1Q	- Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks
802.1s	- Standard for Local and Metropolitan Area Networks - Amendment 3 to 802.1Q Virtual Bridged Local Area Networks: Multiple Spanning Trees
802.1v	- Standard for Local and Metropolitan Area Networks - Virtual Bridge Local Area Networks - Amendment 2: VLAN Classification by Protocol and Port (Amendment to IEEE 802.1Q, 1998 Edition)
802.1w	- Standard for Local and metropolitan area networks - Common Specifications - Part 3: Media Access Control (MAC) Bridges: Rapid Configuration
802.1x	- Standard for Local and Metropolitan Area Networks Port-Based Network Access Control
802.3ad	- Standard for Information Technology – Local and Metropolitan Area Networks – Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications–Aggregation of Multiple Link Segments
ASVALAN	- Assured Services Voice Application LAN
CoS	- Class of Service
DISA	- Defense Information Systems Agency
DSCP	- Differentiated Services Code Point
GSCR	- Generic Switching Center Requirements
IEEE	- Institute of Electrical and Electronics Engineers
IP	- Internet Protocol
IPv4	- Internet Protocol version 4
IPv6	- Internet Protocol version 6
LAN	- Local Area Network
MAC	- Media Access Control
Mbps	- Megabits per second
N	- total VoIP users / 64
OSPF V.3	- Open Shortest-Path First Version 3
PHB	- Per Hop Behaviors
QoS	- Quality of Service
SNMP	- Simple Network Management Protocol
STIGs	- Security Technical Implementation Guides
TE	- Traffic Engineering
ToS	- Type of Service
VALAN	- Voice Application LAN
VLANs	- Virtual LANs
VoIP	- Voice over Internet Protocol
VRRP	- Virtual Router Redundancy Protocol
NOTES:	
1	For core and distribution components, OSPF V.3 redundancy protocol shall be the routing protocol supported. For access components, redundancy protocol shall be VRRP or equivalent protocol.
2	Verified using the Information Assurance Test Plan. Results of the security testing are published in a separate test report generated by the DISA Information Assurance test personnel.
3	An IPv6 capable system or product, as defined in the GSCR, paragraph 1.7, shall be capable of receiving, processing, and forwarding IPv6 packets and/or interfacing with other systems and protocols in a manner similar to that of IPv4. IPv6 capability is currently satisfied by a vendor Letter of Compliance signed by the Vice President of the company. The vendor must state, in writing, compliance to the following criteria: <ul style="list-style-type: none"> a. Conformance with IPv6 standards profile contained in the Department of Defense Information Technology Standards Registry (DISR). b. Maintaining interoperability in heterogeneous environments and with IPv4. c. Commitment to upgrade as the IPv6 standard evolves. d. Availability of contractor/vendor IPv6 technical support.
4	Instruments connected to an access device must provide a minimum of a 10 Mbps full duplex link. For core and distribution connections, the minimum link capacity is 100 Mbps full duplex.

8. TEST NETWORK DESCRIPTION. The SUT was tested at JITC's Global Information Grid Network Test Facility in a manner and configuration similar to that of the DSN operational environment. Figure 2-5 depicts the SUT test configuration.

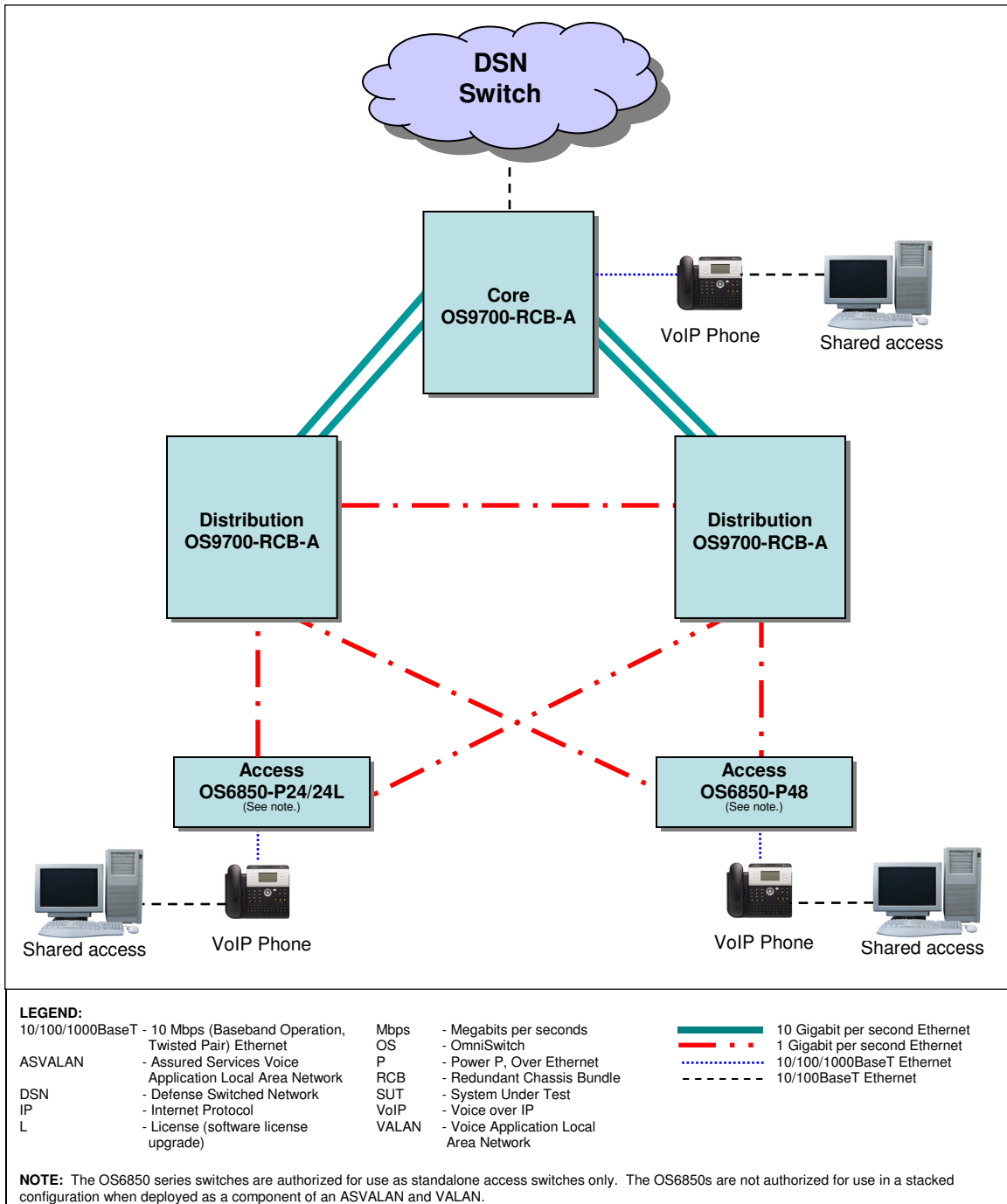


Figure 2-5. SUT Test Configuration

9. SYSTEM CONFIGURATIONS. Table 2-3 provides the system configurations, hardware and software components tested with the SUT. The SUT was tested in an operationally realistic environment to determine interoperability with the DSN switch noted in table 2-3. The DSN switch listed in table 2-3 only depicts the tested configuration. Table 2-3 is not intended to identify the only switches that are certified with the SUT. The SUT is certified with switching systems listed on the DSN APL that are certified for use with an ASVALAN or VALAN.

Table 2-3. Tested System Configurations

System Name	Software Release		
Cisco Call Manager	Version 4.2(3) Service Release 3 with IOS Software Release 12.4(9) T1		
System Under Test Components with Current Operating System			
Component (See note.)	Release	Sub-component (See note.)	Function
<u>OS9700-RCB-A</u>	6.1.5.506. R01	<u>OS9600/OS9700-CMM</u>	Core Processor -Chassis Management Module
		<u>OS9-XNI-U2</u>	2-port 10 Gigabit Ethernet Network Interface module
		<u>OS9-GNI-U24</u>	24-port 1 Gigabit Ethernet Network Interface module
		<u>OS9-GNI-P24</u>	24-port 10/100/1000 Mbps copper Network Interface with PoE module
		OS9-GNI-C24	24-port 10/100/1000 Mbps copper Network Interface module
		OS9-GNI-C48T	48-port 10/100/1000 Mbps copper with mini-RJ21 connectors module
<u>OS6850-P48</u> , OS6850-P48H, OS6850-P48L, OS6850-P48LH, OS6850-48D, OS6850-48L, OS6850-48LD	6.1.5.506. R01	Not Applicable	48-port 10/100/1000 Edge switch
<u>OS6850-P24</u> , OS6850-P24H, OS6850-24, OS6850-24D, <u>OS6850-P24L</u> , OS6850-24LD, OS6850-24L, OS6850-24LH	6.1.5.506. R01	Not Applicable	24-port 10/100/1000 Edge switch
LEGEND: A - Alternating current power supply CMM - Chassis Management Module C - Copper D - Direct Current power supply G - Gigabit H - High-PoE power supply (510 watts) IOS - Internetwork Operating System JITC - Joint Interoperability Test Command L - License (software license upgrade) Mbps - Megabits per second NI - Network Interface OS - OmniSwitch P, PoE - Power over Ethernet RCB - Redundant Chassis Bundle RJ - Registered Jack T - Telco U - Unshielded Twisted Pair X - 10 Gigabit Small Form Factor Pluggable			
NOTE: Components and sub-components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same operating software and hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use.			

10. TESTING LIMITATIONS. None.

11. TEST RESULTS

a. Components. The SUT met the minimum interoperability requirements of the GSCR, appendix 3, for an ASVALAN. If a system meets the minimum requirements for an ASVALAN, it also meets the lesser requirements for a VALAN. The network consisted of three main components: core, distribution, and access switches. The SUT system and component test results are provided below.

(1) Class of Service (CoS). The GSCR, appendix 3, section A3.3.2, outlines several methodologies to implement CoS. The SUT employed IEEE 802.1p/Q at the Data Link Layer (L2) and Differentiated Services Code Point (DSCP) at the Network Layer (L3) and 802.1p/Q to DSCP mapping, which was verified by capturing packets at both layers within the network.

(2) Traffic Prioritization. Priorities were applied in accordance with the CoS listed above. As required by the GSCR, this ensured voice signaling would get the highest level of priority; voice media stream would be prioritized lower than voice signaling but higher than data, and data traffic would receive the lowest priority. At L2, packets were tagged as: Data traffic = 0, Voice media = 5 and Voice Signaling and Network Management = 6, for L3 prioritization, DSCP were marked 0, 46, and 48 respectively. By filling uplinks to capacity with data packets tagged at 0, voice packets were transmitted and tagged with 46 for voice media and 48 for voice signaling. The packets were placed in a higher queue and were not delayed throughout the network. The SUT configuration for all access layer ports was trusted. This was accomplished by default or by assigning the trust QoS statements to all ports. By filling uplinks to capacity with data packets tagged at 0, voice packets were transmitted and tagged with 5 and 6. The packets received the correct precedence and were not delayed.

In addition, flooding parameters were set to prevent broadcast and multicast traffic from overwhelming the ports. Broadcast and multicasts limits were set to no greater than 10 percent on ten-gigabit links, fifty-percent on one-gigabit links and fifty-percent on 10/100/1000 Mbps ports.

(3) QoS. The SUT QoS process is supported by 8 queues using Priority Queuing at L2 and L3. Packets tagged with a CoS of 6 are queued in the highest priority queue. The CoS values of 5 and 0 are placed in separate queues, with 5 receiving a higher value therefore, it will be serviced more frequently than 0. These tags were used to identify and separate traffic types that pass through the network connections ensuring that signaling traffic and voice traffic take precedence over data traffic.

(4) Policing. The SUT implemented Differentiated Services (DiffServ) Per-Hop Behavior (PHB) that uses DSCP values to define how traffic is treated at each individual network node. DSCP values are used from the L3 IP header.

(a) Queuing. The GSCR, appendix 3, paragraph 3.3.3.1, outlines that an ASVALAN must support at least one of the following queuing mechanisms: Priority Queuing, Custom Queuing, Weighted Fair Queuing, or Class-Based Weighted Fair

Queuing. The SUT supports all of the queuing mechanisms; however, only Priority Queuing was tested and is covered under this certification. Priority Queuing supports queues from high to low. All packets of a higher priority queue will be transmitted before any packets from a lower priority queue. Queues are serviced in order of queue priority. The highest queue gets serviced first and then the next lower priority queue. If a lower priority queue is being serviced and a packet in the higher queue enters the higher queue, the higher priority queue gets serviced immediately after the current packet from the lower queue is sent. Then, once the higher priority queue is empty, the lower priority queue continues being serviced.

L2 packets tagged with a CoS of 6 are queued in the highest priority queue. The CoS values 5 and 0 are serviced in separate queues, with 5 receiving a higher value therefore, the Cos value of 5 will be serviced more frequently than 0. These tags are used to identify and separate traffic types as the packets pass through network connections ensuring voice traffic takes precedence over data traffic.

(b) Policing. Traffic Policing limits the input or output transmission rate of a class of traffic based on user-defined criteria and marks packets by setting the IP Precedence value, the QoS group, or the DSCP value. The GSCR, appendix 3, paragraph A3.3.3.2, outlines that the ASVALAN must meet at least one of the following policing mechanisms: DiffServ PHB, Generic Traffic Shaping (GTS), or Class-Based Shaping (CBS). The SUT implemented DiffServ PHB which uses DSCP values to define how traffic is treated at each individual node. DSCP values are used from the L3 IP header. Traffic sharing a common DSCP header is known as a forwarding class. The forwarding behavior applied by a DiffServ-compliant node to each forwarding class is known as PHB. The DiffServ domain marks the DSCP values in packets so they can be routed to the same PHB on the next forwarding nodes until the packet reaches the final destination or leaves the DiffServ domain. Accurate metering, policing and shaping protect the DiffServ domain from excessive traffic loading. The DiffServ PHBs map directly to the following internal forwarding classes along the path of the packet:

- Expedited Forwarding (EF) classes enjoy a premium forwarding status above all other classes. Other forwarding classes cannot affect the latency or jitter experienced by traffic in these premium classes. The EF PHB allows unlimited preemption of other traffic, the implementation limits damage EF traffic inflicts on other traffic. The DSCP values of 46 for voice media and 48 for voice signaling are placed in the EF class.
- Assured Forwarding class packets transmitted through the queue at or below the committed transmission rate are marked “in-profile.” If sufficient bandwidth is available along the path for assured traffic, packets will reach their destination. Packets transmitted out of the service queue that are above the committed rate and reach congestion in the network, are discarded before “in-profile” assured service packets.
- Best Effort Forwarding packets are lower priority packets and are forwarded after Expedited and Assured Forwarding packets have been forwarded.

(5) Virtual LAN (VLAN). The GSCR, appendix 3, paragraph A3.3.3.3, outlines that the ASVALAN shall support either implicit or explicit VLAN membership for: Port-based VLANs, Media Access Control (MAC) address-based VLANs, or L3 protocol-based VLANs. The SUT supports port-based VLANs. Switches within the topology were configured with multiple VLANs using the IEEE 802.1Q tag to separate data from voice traffic. MAC address and Protocol-based VLANs were verified through the LoC as well as packet captures.

(6) IEEE Conformance. All aspects of IEEE conformance were met through the LoC or testing. All test results are discussed under their respective topics.

(7) Reliability. The GSCR, appendix 3, section A3.3.4.1, requires that there be no single point of failure within the ASVALAN that can cause an outage of more than 64 telephony subscribers. In order to meet the availability requirement of an ASVALAN, all switching/routing platforms that offer more than 64 telephony subscribers shall have a switch design or configuration that provides at a minimum dual power supplies, dual processors, redundancy protocol, and switch fabric redundancy. To meet the reliability requirements, dual Gigabit and/or 10 Gigabit Link Aggregation was configured between the core and distribution switches, and dual Gigabit and/or 10 Gigabit L2 rapid spanning tree links connected the distribution and access switches, as shown in figure 2-5. The link aggregation from the distribution to the core must be terminated onto separate fiber cards at the core switch. Reliability is a conditional requirement for a VALAN.

(8) Network Management. The GSCR, appendix 3, paragraph A3.3.4.2, requires that the vendor provide a management system to monitor the performance of the ASVALAN portion of the VoIP system. Due to numerous third party systems and applications capable of performing this function, this requirement was verified via LoC. Network Management features are conditional requirements for a VALAN.

(9) Security. Security requirements in accordance with the GSCR, appendix 3, paragraph A3.3.4.3, were verified using the Information Assurance Test Plan. Results of the security testing are reported in a separate test report generated by the Defense Information Systems Agency (DISA) Information Assurance test personnel.

(10) IPv6. An IPv6 capable system or product, as defined in the GSCR, paragraph 1.7, shall be capable of receiving, processing, and forwarding IPv6 packets and/or interfacing with other systems and protocols in a manner similar to that of IPv4. IPv6 capability is currently satisfied by testing and a vendor LoC signed by the Vice President of the company. The vendor stated, in writing, compliance to the following criteria:

(a) Conformant with IPv6 standards profile contained in the Department of Defense (DoD) Information Technology Standards Registry (DISR).

(b) Maintaining interoperability in heterogeneous environments and with IPv4.

(c) Commitment to upgrade as the IPv6 standard evolves.

(d) Availability of contractor/vendor IPv6 technical support.

(11) Traffic Engineering

(a) **Links.** To meet the ASVALAN requirements for failover, all links connected between the core and distribution switches and between the distribution switches were configured as Link Aggregation. The link aggregation between the core and distribution must be terminated on separate fiber cards at each switch.

(b) **Scalability.** The SUT can be scaled to meet any number of IP phone subscribers as long as the SUT is composed of the equipment and software listed in table 2-3, and are consistent with traffic engineering constraints contained in the GSCR, appendix 3. Table 2-4, which was approved by the DSN Configuration Control Board (DSN CCB) on Dec 2004, outlines the maximum number of subscribers that can be supported per each link capacity.

Table 2-4. IP Subscriber Supportability by Link Capacity

Link Type	LAN BW	Users
Non-Converged	10 Mbps	64 (See note 1.)
	100 Mbps	64 (See note 1.)
	1 Gbps	64 (See note 1.)
	10 Gbps	64 (See note 1.)
	10 Mbps LP	100 (See note 2.)
	100 Mbps LP	1000 (See note 2.)
	1 Gbps LP	10000 (See note 2.)
	10 Gbps LP	100000 (See note 2.)
Converged	10 Mbps	25 (See note 3.)
	100 Mbps	64 (See note 1.)
	1 Gbps	64 (See note 1.)
	10 Gbps	64 (See note 1.)
	10 Mbps LP	25 (See note 3.)
	100 Mbps LP	250 (See note 4.)
	1 Gbps LP	2500 (See note 4.)
	10 Gbps LP	25000 (See note 4.)
LEGEND: ASVALAN - Assured Services Voice Application LAN BW - Bandwidth Gbps - Gigabits per second IP - Internet Protocol kbps - kilobits per second LAN - Local Area Network LP - Link Pair Mbps - Megabits per second		
NOTES: 1 For single links, number of telephony subscribers is limited to a maximum of 64 because of single point of failure. This limit applies specifically to ASVALANs. 2 The number of users is calculated as bandwidth (BW) divided by 100 kbps per user. 3 The number of users was limited to 64 telephony subscribers per note 1 or 25% of total users per note 1, whichever was less. 4 For the converged network, voice traffic was engineered not to exceed 25 % of total utilization using an estimated 100 kbps per voice call.		

(12) LAN Architectures. The OS9700-RCB-A switch is certified in the core, distribution, and access layer when deployed as a component in an ASVALAN or VALAN. The OS6850 switch family is certified in the access layer only when deployed as a component in an ASVALAN or VALAN. The OS9700-RCB-A and OS6850 switches were tested with 100/1000/10000 Megabits per second (Mbps) voice media and data load using the Ixia loader. The OS6850 can be configured in the stacked configuration, however this configuration did not meet GSCR failover reliability requirements and therefore the stacked configuration is not certified or authorized for use within the DSN by the PMO.

Shared access (i.e., same switch port is shared by Personal Computer and IP phone), was tested and is certified with this configuration for shared access for speeds up to 100 Mbps full duplex. To test 100 Mbps shared access, the IP phones were connected to the 100 Mbps full duplex access switch port and data was generated on the 100 Mbps full duplex Ethernet port on the back of the phones using an IXIA test set. All SUT switches that provide Ethernet access ports in this certification were tested for shared access with no measurable degradation of voice quality. Voice signaling, voice media and data packets were properly queued by the SUT.

To meet the ASVALAN failover requirements, Open Shortest Path First version 3 (OSPF V.3) was implemented between the core and distribution layer. OSPF V.3 utilizes link-state protocols to identify lowest cost paths within the LAN. Additionally, OSPF V.3 is an open standard, and is a common protocol between different vendors equipment.

(a) Delay. The GSCR, appendix 3, section A3.3.1.1, states the one-way packet delay shall be five milliseconds (ms) or less, as measured over a five-minute period. The average one-way delay for each of the sampled five-minute periods, measured between the access and core devices, was 0.02 ms, with a maximum delay of 1.0 ms, which met the requirement.

(b) Jitter. The GSCR, appendix 3, section A3.3.1.2 states jitter for voice media packets will be 5 ms or less as averaged over any five-minute period. With a 100% bandwidth load, jitter was measured to be 0.000 ms or less over a five-minute period, which met the requirement.

(c) Packet Loss. Network packet loss occurs when packets are sent, but not received at the final destination. The GSCR, appendix 3, section A3.3.1.3, states that LANs shall be engineered so the measured voice packet loss within the LAN shall not exceed 0.05% averaged over any five-minute period. With 100% bandwidth load, the measured packet loss was 0.001%, which met the requirement.

b. System Interoperability Results. The SUT is certified for joint use within the DSN with the Digital Switching Systems listed on the DSN APL which are certified for use with an ASVALAN or VALAN. The SUT is certified to support DSN Assured Services over IP as an ASVALAN in accordance with the requirements set forth in the

GSCR, appendix 3. The SUT is also certified as a VALAN. However, since VALANs do not support the Assured Services Requirements detailed in reference (c), Command and Control (C2) users and Special C2 users are not authorized to be served by a VALAN. Since VALANs do not support Assured Services, they can only serve DoD, non-DoD, non-governmental, and foreign government users having no missions or communications requirement to ever originate or receive C2 communications. VALAN connectivity to the DSN is not authorized until a waiver is granted by the Joint Staff for each site. The system interoperability test summary is shown in table 2-5 and the detailed component interoperability test status is shown table 2-6.

Table 2-5. SUT System Interoperability Test Summary

Device Requirement ¹	Reference	Test Results	Remarks
Delay measured at 5 ms or less	GSCR, Appendix 3, A3.3.1.1	Met	The average was 0.02 ms and the maximum was 1.0 ms.
Jitter measured at less than 5 ms	GSCR, Appendix 3, A3.3.1.2	Met	Measured to be 0.0 ms or less.
Packet Loss less than 0.05%	GSCR, Appendix 3, A3.3.1.3	Met	Measured to be 0.001%.
Reliability	GSCR, Appendix 3, Section A.3.3.4.1	Met	See note 2.
IPv6	GSCR, Appendix 3, Section A3.2.8	Met	See note 3.
Security	GSCR, Appendix 3, A3.2.4	Met	See note 4.
LEGEND: ASVALAN - Assured Services Voice Application Local Area Network DISA - Defense Information Systems Agency DISR - DoD Information Technology Standards Registry DoD - Department of Defense GSCR - Generic Switching Center Requirements IPv4 - Internet Protocol version 4 IPv6 - Internet Protocol version 6 ms - millisecond SUT - System Under Test VALAN - Voice Application Local Area Network			
NOTES: 1 If a system meets the minimum requirements for an ASVALAN, it also meets the lesser requirements for a VALAN. 2 Reliability is a conditional requirement for a VALAN. 3 An IPv6 capable system or product, as defined in the GSCR, paragraph 1.7, shall be capable of receiving, processing, and forwarding IPv6 packets and/or interfacing with other systems and protocols in a manner similar to that of IPv4. IPv6 capability is currently satisfied by a vendor Letter of Compliance signed by the Vice President of the company. The vendor must state, in writing, compliance to the following criteria: a. Conformance with IPv6 standards profile contained in the DISR. b. Maintaining interoperability in heterogeneous environments and with IPv4. c. Commitment to upgrade as the IPv6 standard evolves. d. Availability of contractor/vendor IPv6 technical support. 4 Security is tested by DISA-led Information Assurance test teams and published in a separate report.			

Table 2-6. Component Interoperability Test Summary

DSN Line Interfaces						
Interface	Component (See note 1.)	Status	Device Requirement	Test Results	Reference	Remarks
1000/10000 BaseFX 10/100/1000 BaseT	<u>OS9700-RCB-A</u>	Certified as: Core Distribution Access	CoS Models	Met	GSCR, Appendix 3, A3.3.2.1	
			Traffic Prioritization	Met	GSCR, Appendix 3, A3.3.2.2	
			QoS	Met	GSCR, Appendix 3, A3.3.3	
			Policing	Met	GSCR, Appendix 3, A3.3.3.2	
			VLANs	Met	GSCR, Appendix 3, A3.3.3.3	
			IEEE Conformance	Met	GSCR, Appendix 3, A3.3.4	
			Reliability	Met	GSCR, Appendix 3, A3.3.4.1	Reliability is a conditional requirement for a VALAN. ²
			Network Management	Met	GSCR, Appendix 3, A3.3.4.2	Network Management Reliability is a conditional requirement for a VALAN. ²
			Security	Met	GSCR, Appendix 3, A3.3.4.3	See note 3.
			IPv6	Met	GSCR, Paragraph 1.7, and Appendix 3, A3.2.8	See note 4.
			TE	Met	GSCR, Appendix 3, A3.3.4.4	For a VALAN, redundant links are not required. ²
1000BaseFX 10/100/1000 BaseT	OS6850-P48 ⁵ , OS6850-P48H ⁵ , OS6850-P48L ⁵ , OS6850-P48LH ⁵ , OS6850-48D ⁵ , OS6850-48L ⁵ , OS6850-48LD ⁵	Certified as: Access	CoS Models	Met	GSCR, Appendix 3, A3.3.2.1	
			Traffic Prioritization	Met	GSCR, Appendix 3, A3.3.2.2	
			QoS	Met	GSCR, Appendix 3, A3.3.3	
			Policing	Met	GSCR, Appendix 3, A3.3.3.2	
			VLANs	Met	GSCR, Appendix 3, A3.3.3.3	
			IEEE Conformance	Met	GSCR, Appendix 3, A3.3.4	
			Reliability	Met	GSCR, Appendix 3, A3.3.4.1	Reliability is a conditional requirement for a VALAN. ²
			Network Management	Met	GSCR, Appendix 3, A3.3.4.2	Network Management Reliability is a conditional requirement for a VALAN. ²
			Security	Met	GSCR, Appendix 3, A3.3.4.3	See note 3.
			IPv6	Met	GSCR, Paragraph 1.7, and Appendix 3, A3.2.8	See note 4.
			TE	Met	GSCR, Appendix 3, A3.3.4.4	For a VALAN, redundant links are not required. ²

Table 2-6. Component Interoperability Test Summary (continued)

DSN Line Interfaces						
Interface	Component (See note 1.)	Status	Device Requirement	Test Results	Reference	Remarks
1000BaseFX 10/100/1000 BaseT	<u>OS6850-P24⁵</u> OS6850-P24H ⁵ , OS6850-24 ⁵ , OS6850-24D ⁵ , <u>OS6850-P24L⁵</u> OS6850-24LD ⁵ , OS6850-24L ⁵ , OS6850-24LH ⁵	Certified as: Access	CoS Models	Met	GSCR, Appendix 3, A3.3.2.1	
			Traffic Prioritization	Met	GSCR, Appendix 3, A3.3.2.2	
			QoS	Met	GSCR, Appendix 3, A3.3.3	
			Policing	Met	GSCR, Appendix 3, A3.3.3.2	
			VLANs	Met	GSCR, Appendix 3, A3.3.3.3	
			IEEE Conformance	Met	GSCR, Appendix 3, A3.3.4	
			Reliability	Met	GSCR, Appendix 3, A3.3.4.1	Reliability is a conditional requirement for a VALAN. ²
			Network Management	Met	GSCR, Appendix 3, A3.3.4.2	Network Management Reliability is a conditional requirement for a VALAN. ²
			Security	Met	GSCR, Appendix 3, A3.3.4.3	See note 3.
			IPv6	Met	GSCR, Paragraph 1.7, and Appendix 3, A3.2.8	See note 4.
TE	Met	GSCR, Appendix 3, A3.3.4.4	For a VALAN, redundant links are not required. ²			
<div><div>LEGEND: 10/100/1000BaseT - 10/100/1000 Mbps (Baseband Operation, Twisted Pair) Ethernet 1000BaseFX - 1000 Mbps Ethernet over fiber 10000BaseFX - 10000 Mbps Ethernet over fiber A - Alternating current power supply ACL - Access Control List ASVALAN - Assured Services Voice Application Local Area Network CB - Chassis Bundle CoS - Class of Service D - Direct Current power supply DISA - Defense Information Systems Agency DISR - DoD Information Technology Standards Registry DoD - Department of Defense GSCR - Generic Switching Center Requirements H - High-PoE power supply (510 watts)</div><div>IEEE - Institute of Electrical and Electronics Engineers IPv4 - Internet Protocol version 4 IPv6 - Internet Protocol version 6 JITC - Joint Interoperability Test Command L - License (software license upgrade) Mbps - Megabits per second OS - OmniSwitch P, PoE - Power over Ethernet QoS - Quality of Service RCB - Redundant Chassis Bundle T - Telco TE - Traffic Engineering VALAN - Voice Application Local Area Network VLAN - Virtual Local Area Network</div></div> <div>NOTES: 1 Components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same software and hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use. 2 If a system meets the requirements for an ASVALAN, it also meets the lesser requirements for a VALAN. 3 Security is tested by DISA-led Information Assurance test teams and published in a separate report. 4 An IPv6 capable system or product, as defined in the GSCR, paragraph 1.7, shall be capable of receiving, processing, and forwarding IPv6 packets and/or interfacing with other systems and protocols in a manner similar to that of IPv4. IPv6 capability is currently satisfied by a vendor Letter of Compliance signed by the Vice President of the company. The vendor must state, in writing, compliance to the following criteria: a. Conformant with IPv6 standards profile contained in the DISR. b. Maintaining interoperability in heterogeneous environments and with IPv4. c. Commitment to upgrade as the IPv6 standard evolves. d. Availability of contractor/vendor IPv6 technical support. 5 The OS6850 series switches are authorized for use as standalone units only. The OS6850s are not authorized for use in a stacked configuration when deployed as a component of an ASVALAN and VALAN.</div>						

12. TEST AND ANALYSIS REPORT. No detailed test report was developed in accordance with the Program Manager's request. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNet at <https://stp.fhu.disa.mil>. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at <https://jit.fhu.disa.mil> (NIPRNet), or <http://199.208.204.125> (SIPRNet). Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at <http://jitc.fhu.disa.mil/tssi>.